

EDUCATION AND TRAINING

CyberSecPro Training

We are creating cutting-edge education and training to advance competencies and professionalism in EU cybersecurity.

OUR VISION

Next level cybersecurity education and training



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Protecting Charging Stations Against Specific Threats

CSP008_S_E

PRESENTATION BY:

- CRISTINA ALCARAZ, UNIVERSITY OF MALAGA, SPAIN

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- *Project Agreement no. 101083594*

Protecting Charging Stations Against Specific Threats

Overview

- Topic-1: Introduction to the Energy Charging Infrastructures
- Topic-2: Security Challenges in Energy Charging Stations
- Topic-3: Cascading Effects and impact to other Critical Infrastructures
- Topic-4: Security Measures and Best Practices for Charging Stations

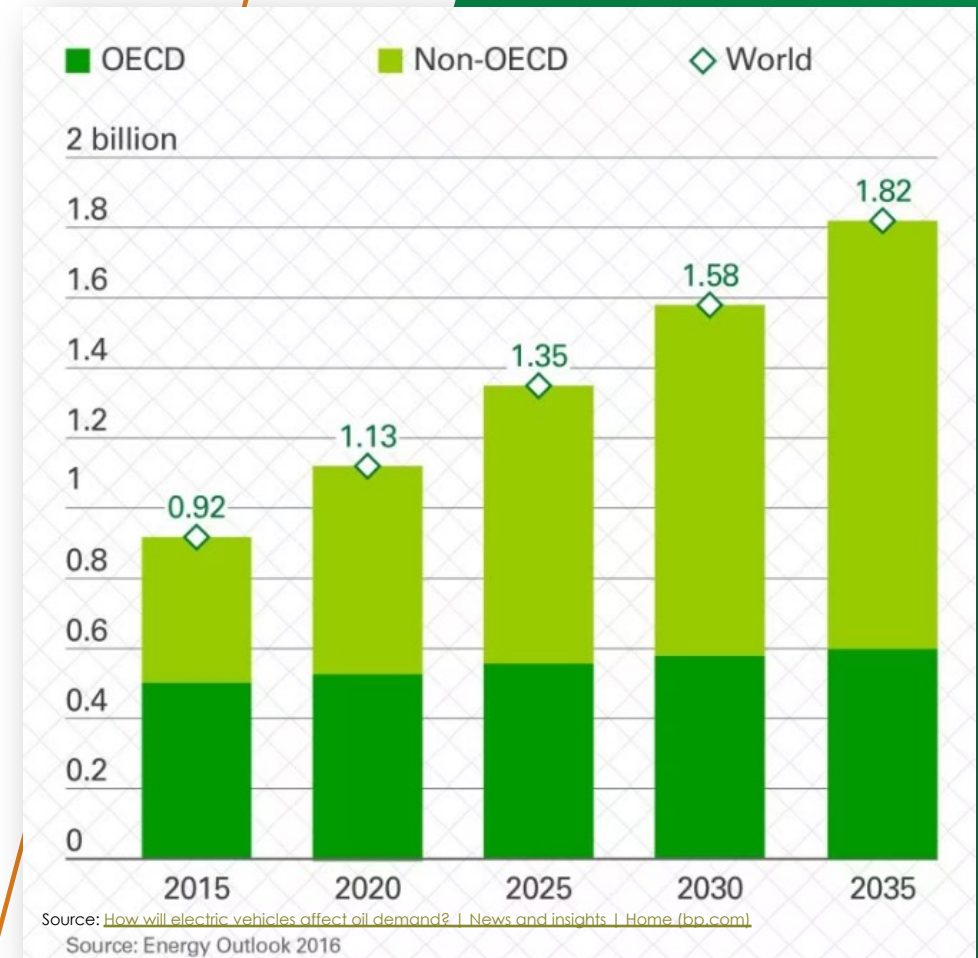
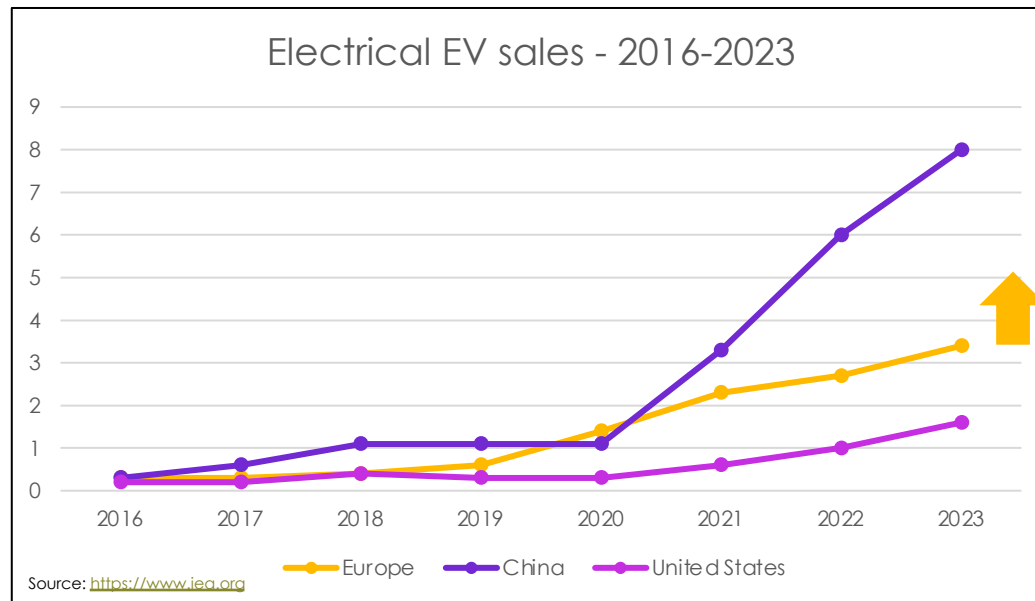
Protecting Charging Stations Against Specific Threats

Overview

- **Topic-1: Introduction to the Energy Charging Infrastructures**
- Topic-2: Security Challenges in Energy Charging Stations
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Energy Charging Infrastructures

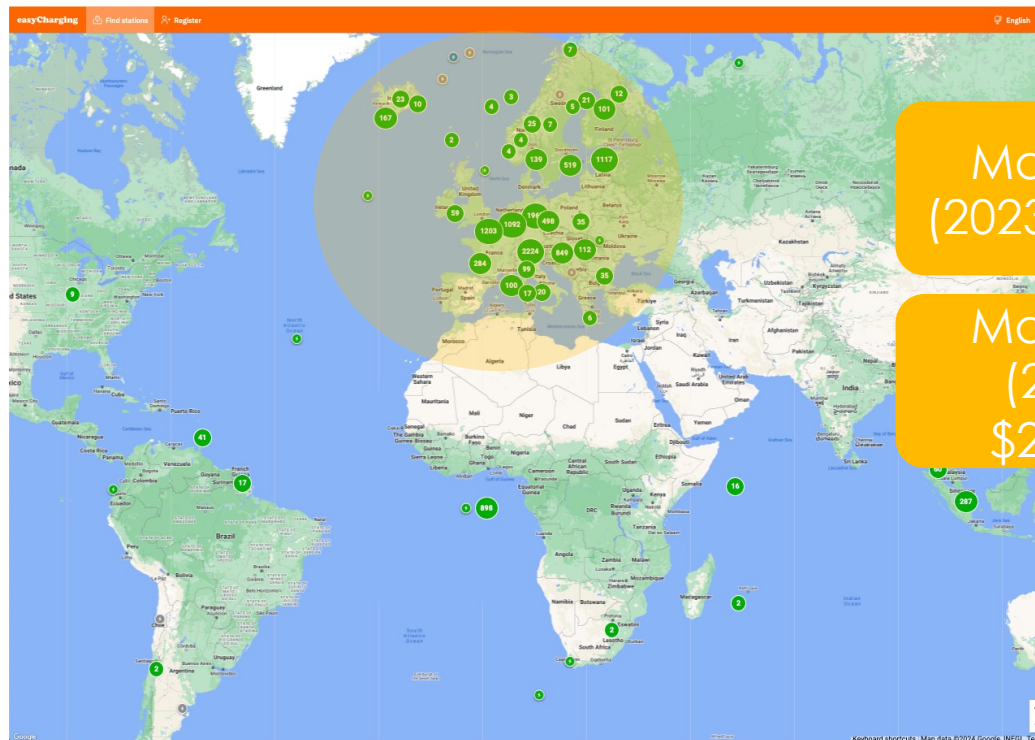
- **Electric Vehicles (EVs)** are nowadays a key measure to curb emissions and support sustainability
 - The International Energy Agency (IEA) stresses that 3.0+ million EVs were sold in Europe in 2023, with a remarkable growth since 2016
 - What is more, BP forecasts a considerable increase in sales between now and 2035



Energy Charging Infrastructures

- Also, the Global Market Insights highlights that “The market size of the EVs charging stations market was valued at USD 38.4 billion in 2023 and is projected to grow between 2024 and 2032 with more than USD 280.5 billion in 2032”

Source: <https://www.iea.org>



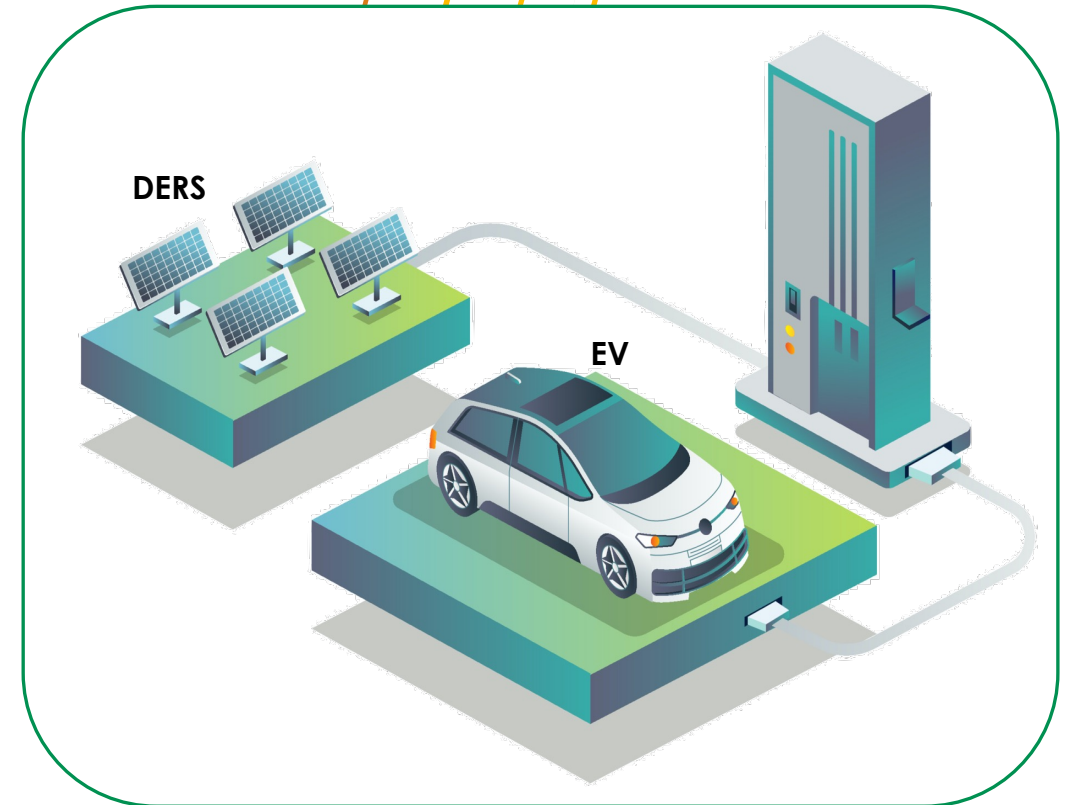
Market Size
(2023): \$38.5BN

Market Size
(2032): >
\$280.5 BN



Energy Charging Infrastructures

- *EV charging infrastructures are composed of:*
 - **Power systems**
 - Distributed Energy Resources (DERs)
 - generators, storage systems, renewable energy systems...
 - Electrical Vehicles (EVs)
 - with batteries and integrated resources



Source: Vecteezy <https://www.vecteezy.com>

Energy Charging Infrastructures

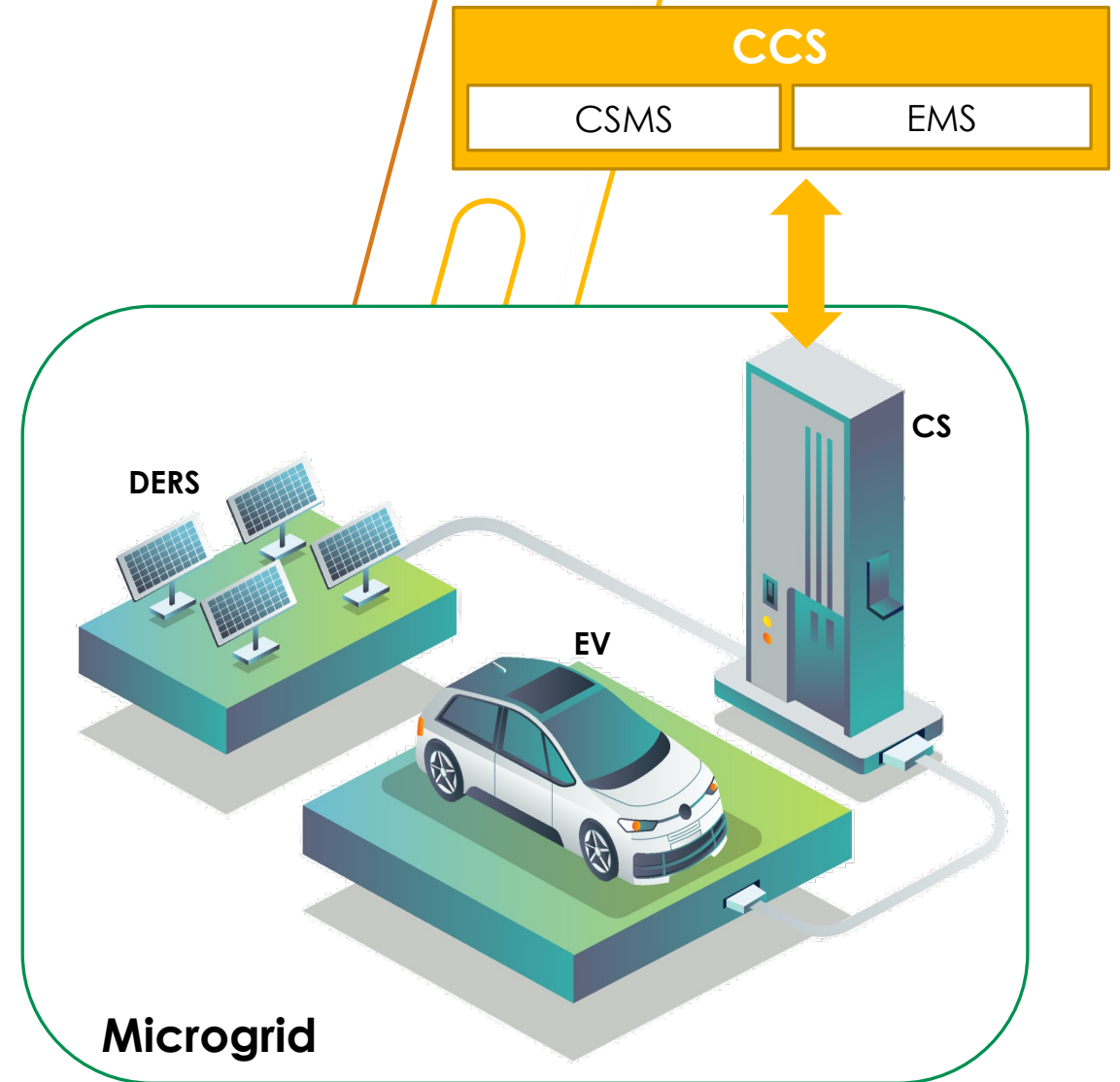
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- **Control systems**

- Central Control System (CCS)
 - CS Management System (CSMS)
 - Energy Management System (EMS)
- Charging Stations (CSs)
 - IT/OT communications
 - Electrical connectors (or EV Supply Equipment (EVSE))
 - Controllers, sensors and smart meters



Source: Vecteezy <https://www.vecteezy.com>



Energy Charging Infrastructures

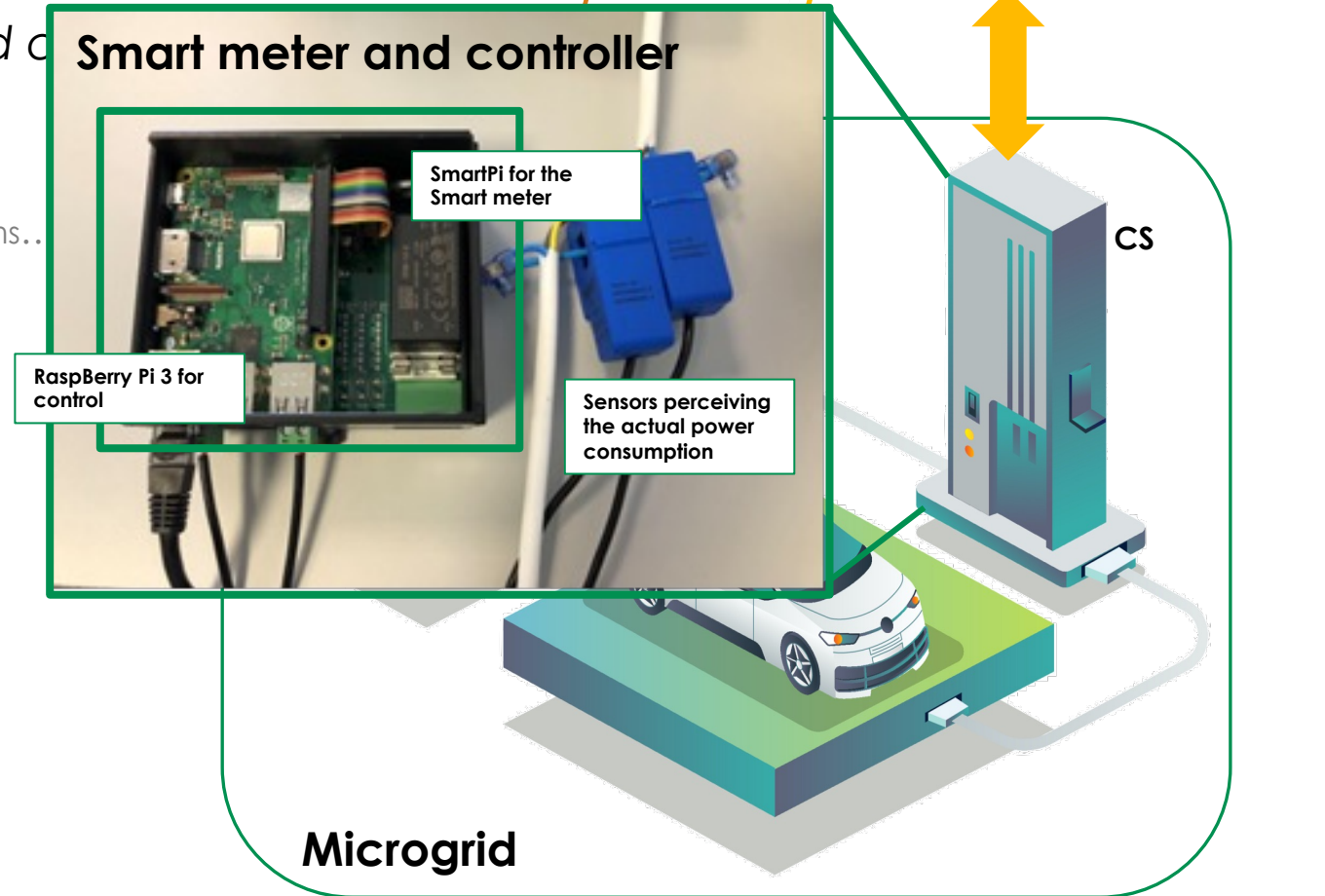
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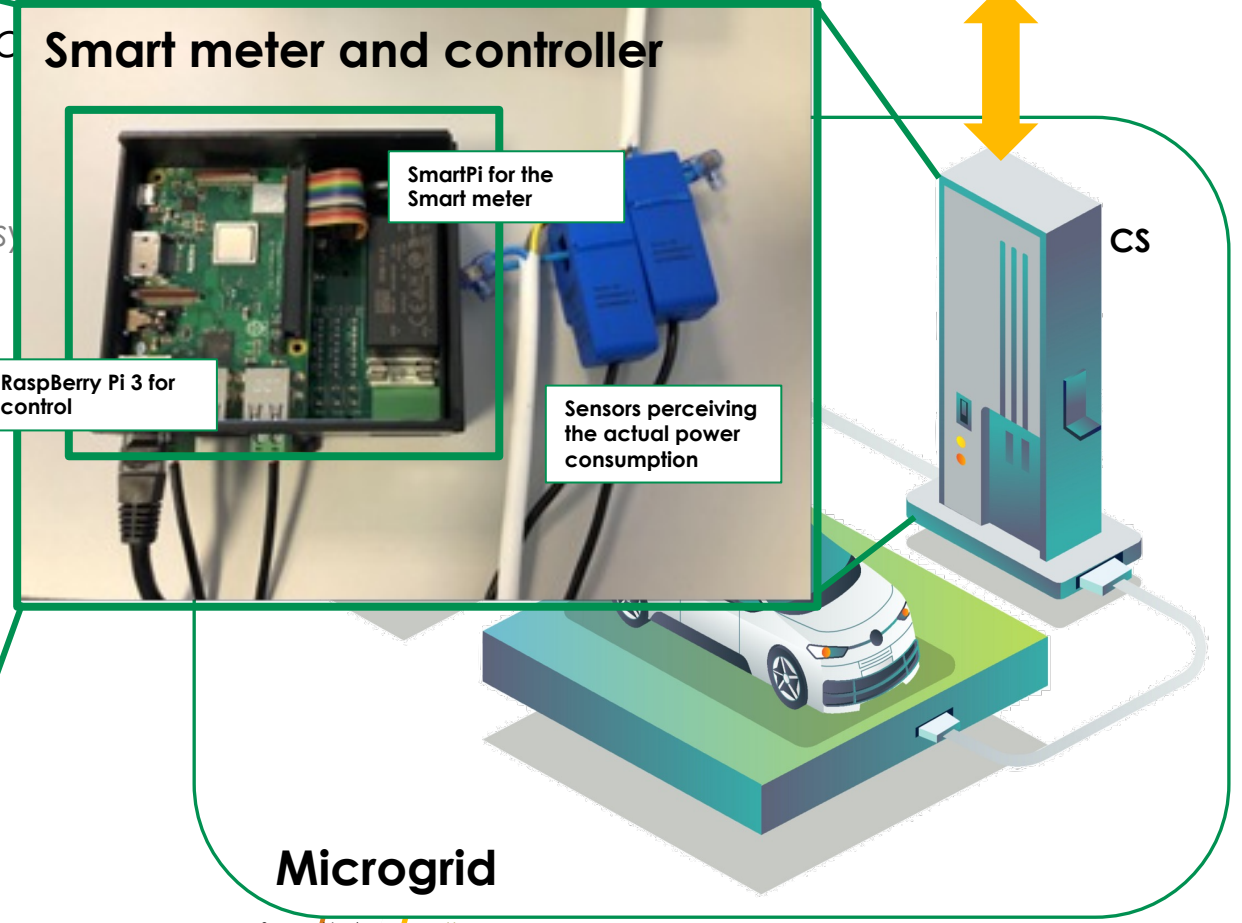
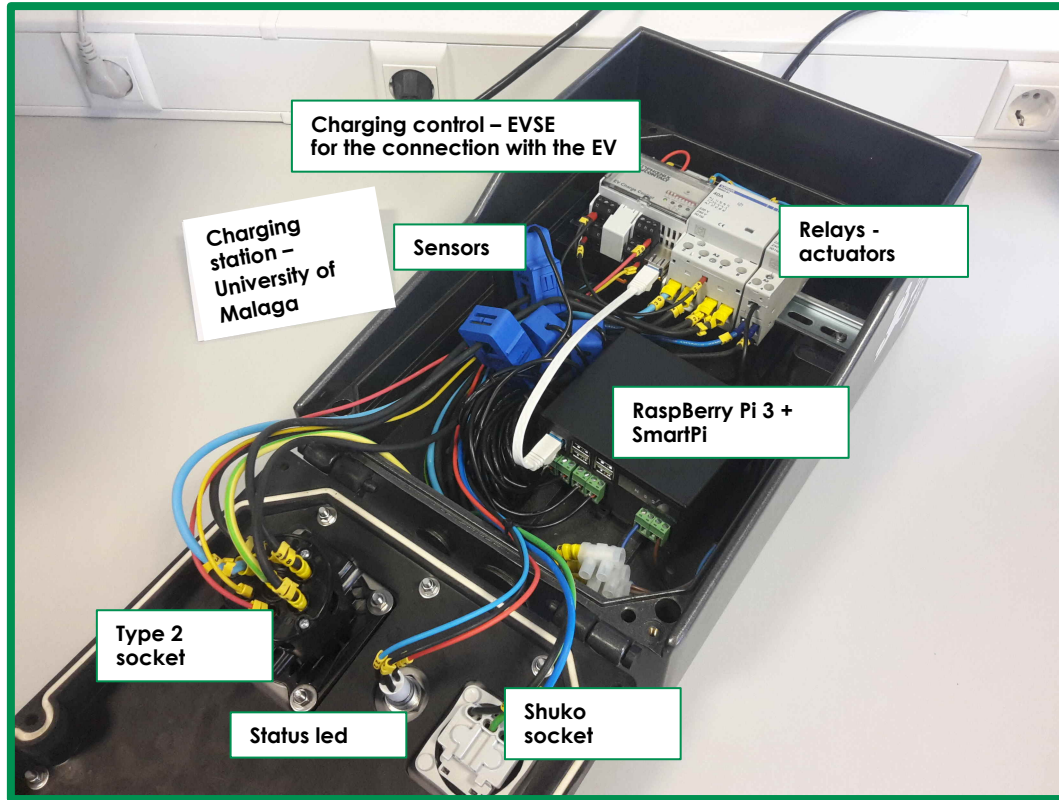
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Energy Charging Infrastructures



- Electrical connectors for EV supply Equipment (EVSE)
- Controllers, sensors and smart meters

Source: Vecteezy <https://www.vecteezy.com>

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Energy Charging Infrastructures

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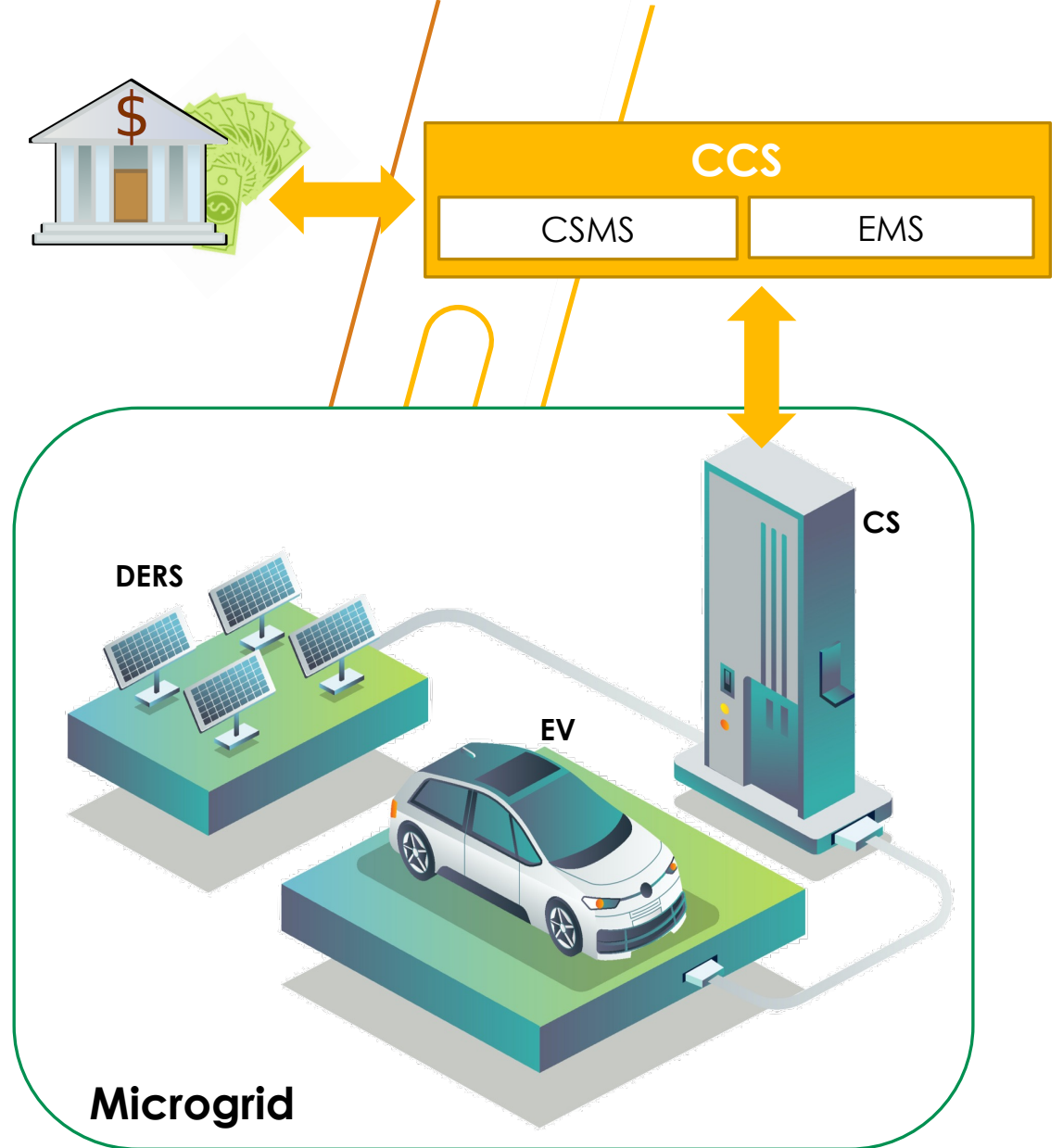
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- **Payment systems**



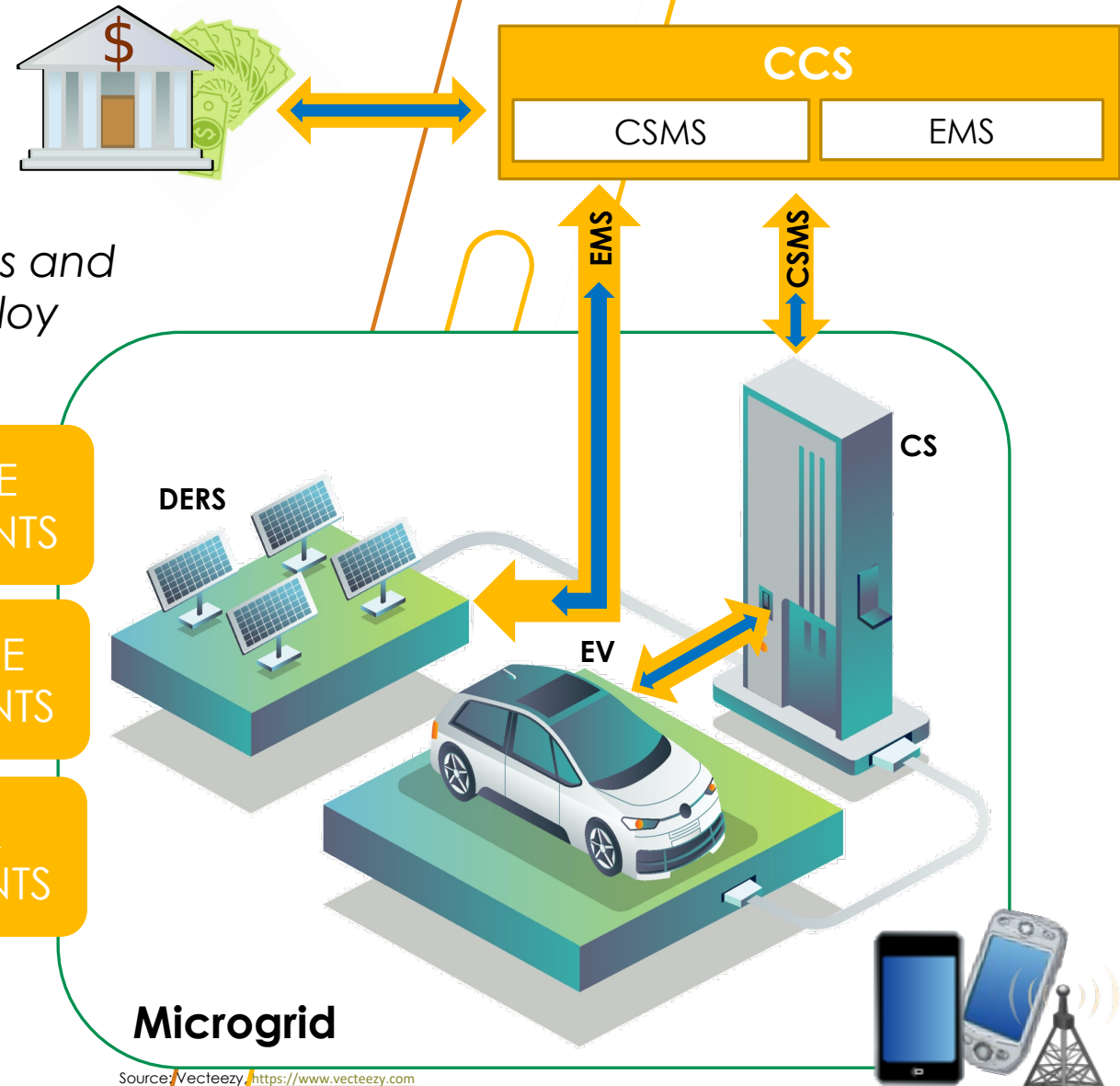
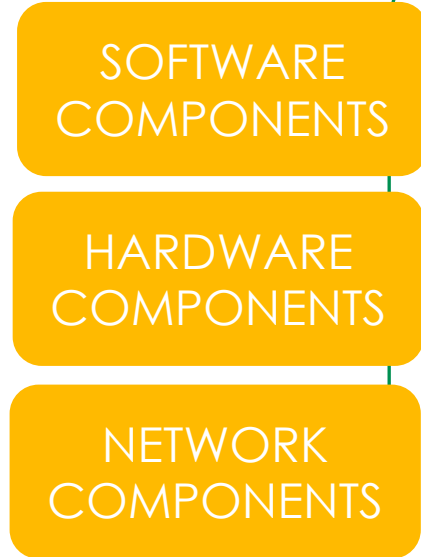
Source: Vecteezy <https://www.vecteezy.com>



Technologies and protocols

• In order to dynamically manage all these systems and their operational processes, it is necessary to deploy various types of information technologies and components

- Internet
- Wireless networks
- Mobile devices
- Firmware
- SW applications
- Web for reservations
- Communication protocols
- ...



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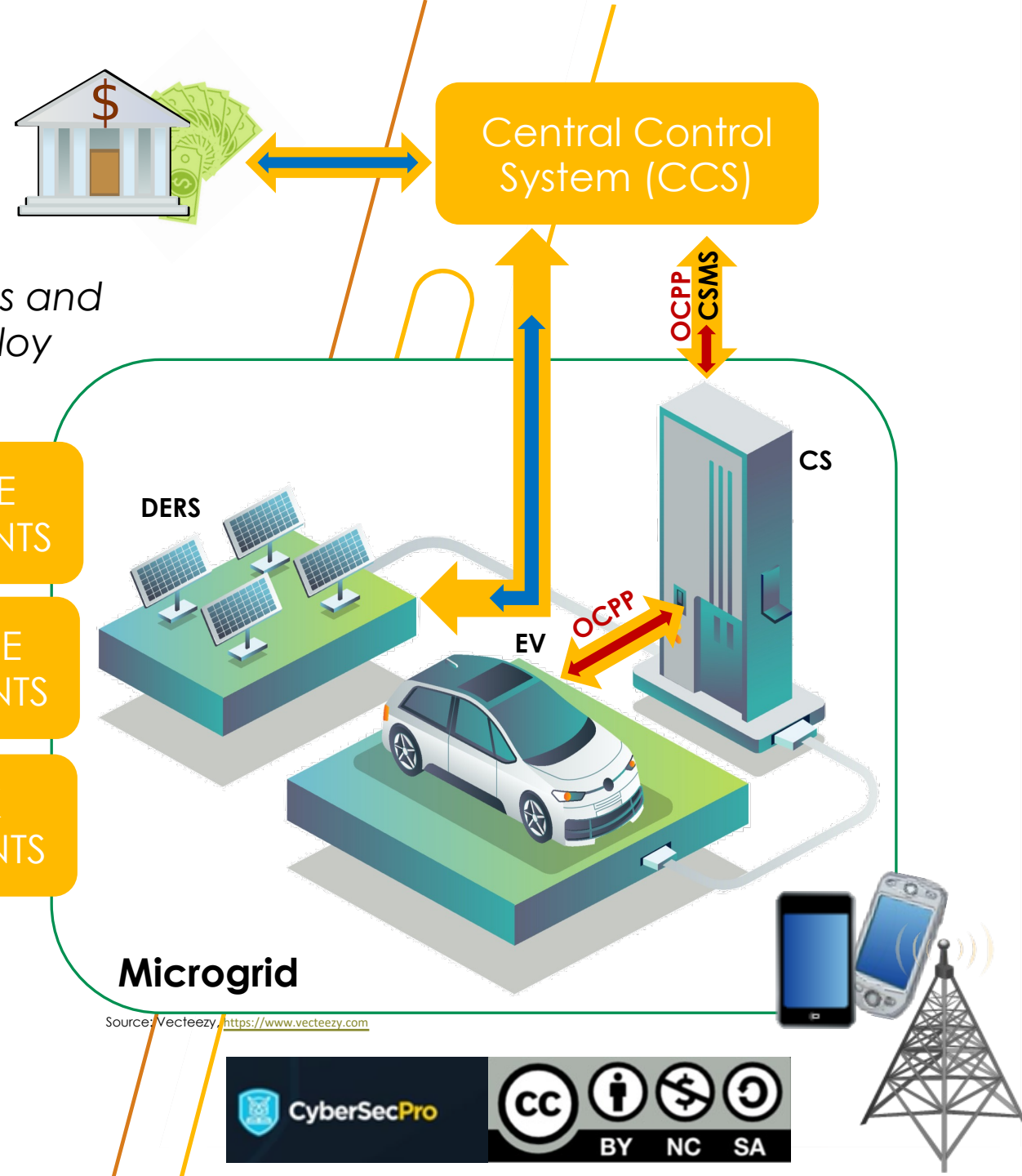
- Internet
- Wireless networks
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- Communication protocols
- ...

• Among the most standardized protocols, we highlight the Open Charge Point Protocol (OCPP)

SOFTWARE COMPONENTS

HARDWARE COMPONENTS

NETWORK COMPONENTS



OCPP - Open Charge Point Protocol

- Control protocol for EV charging infrastructure specified by Open Charge Alliance (OCA)

2018

Significant progress in the last few years

OCPP 1.5

- SOAP
- CS operations
- Central system operations
- XML
- Easy to apply

OCPP 1.6

- OCPP 1.5
- SOAP and JSON
- Smart charging with charging profiles
- (Local) list management
- Diagnosis

OCPP 2.0.1

- OCPP 1.6 plus added functionalities
- Device management
- More functions in the transactions
- **Added security**
- Added smart charging functionalities
- Support for ISO 15118
- Display and message support

OCPP Security Profiles

- The OCPP security architecture defines three levels of security profiles:

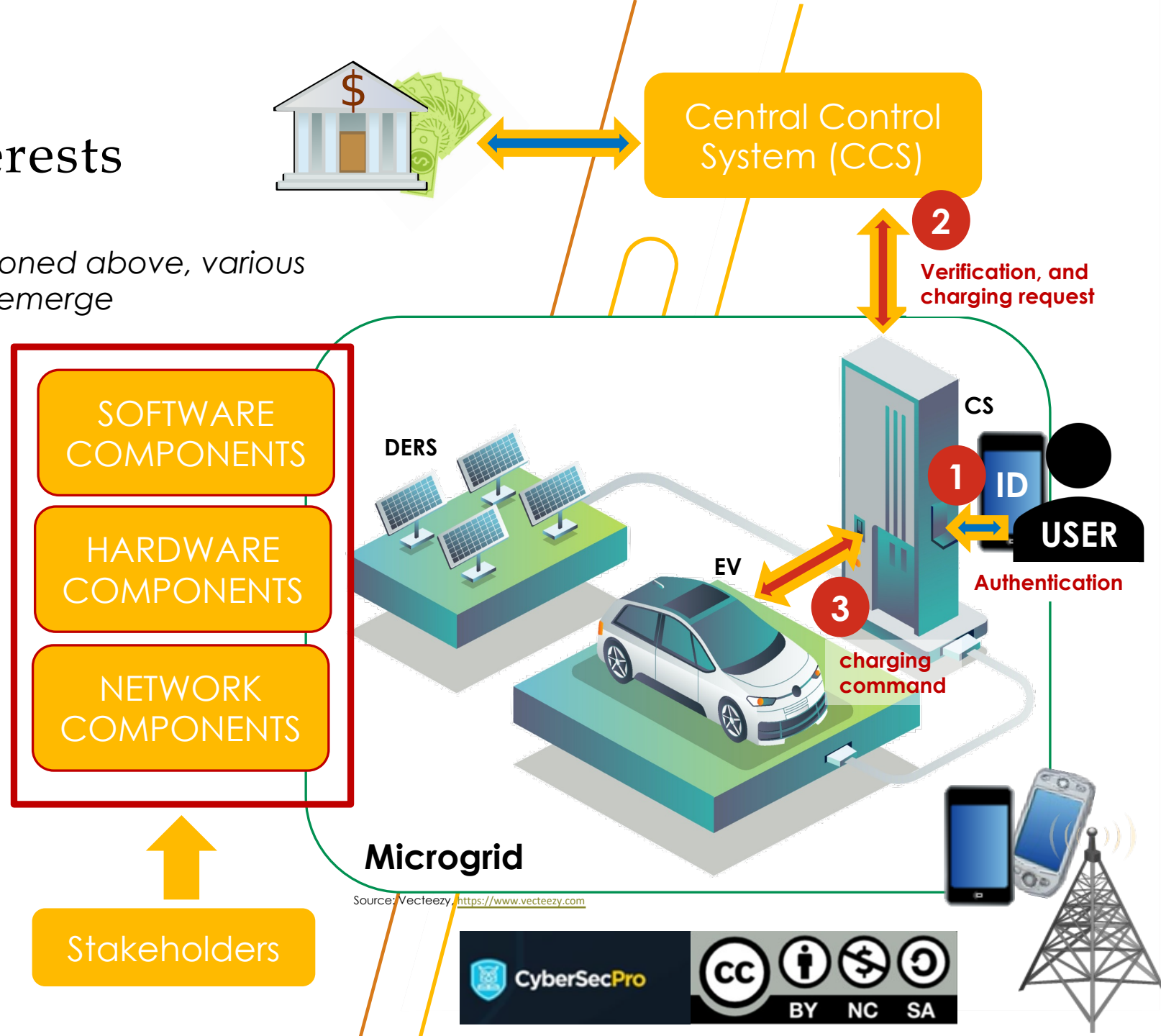
Profile	Channel encryption	Server Auth	Charger Auth
Security Profile 1	–	–	Password
Security Profile 2	TLS 1.2 or higher	Server Certificate	Password
Security Profile 3	TLS 1.2 or higher	Server Certificate	Client Side Certificate

- Security Profile 2 or Security Profile 3, or both must be implemented to receive OCPP Security implementation.

[Open Charge Point Protocol \(OCPP\) Security Explained \(wevo.energy\)](#), accessed in March 2024

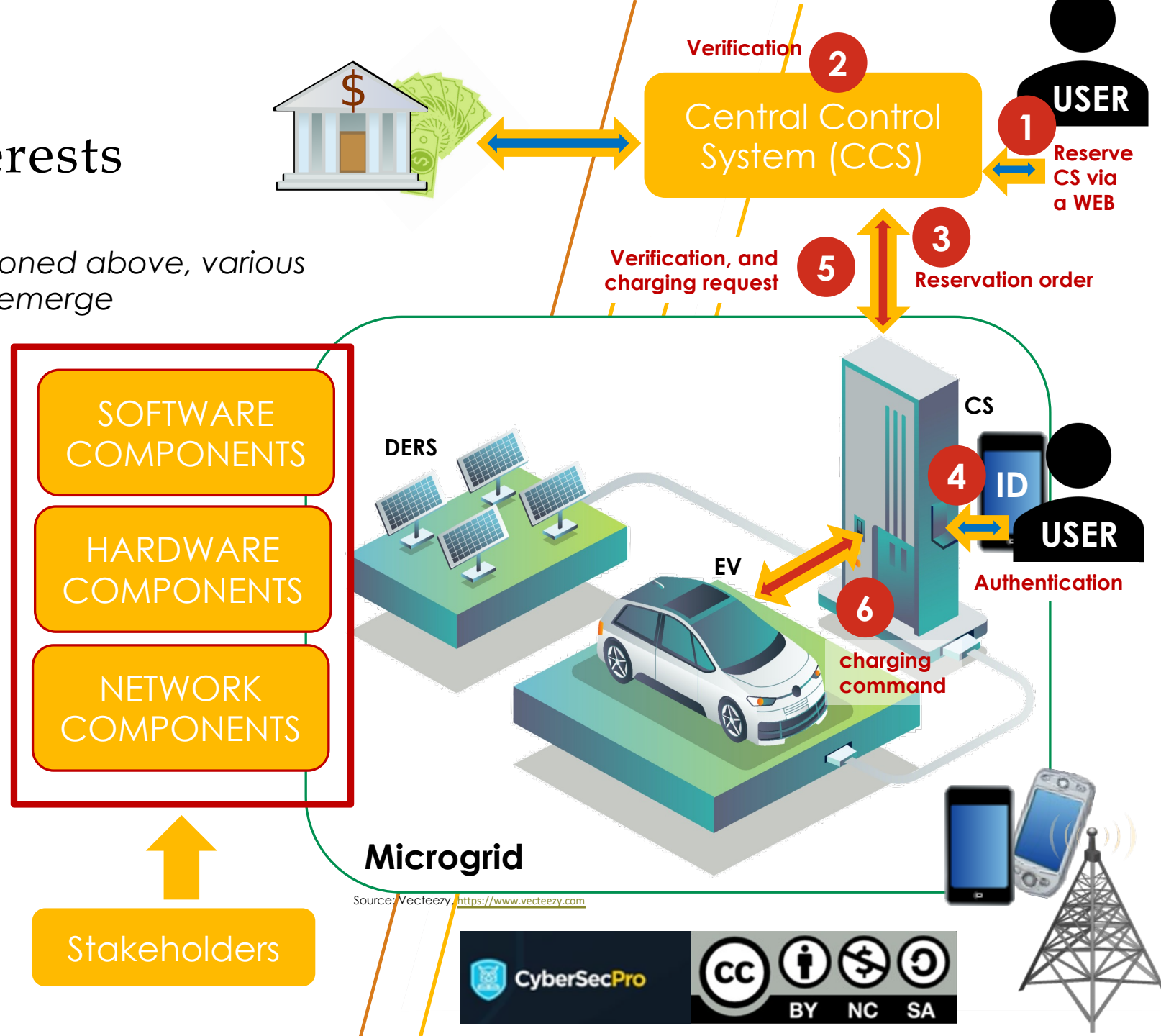
Stakeholders and interests

- In addition to the technologies mentioned above, various types of actors with different interests emerge
 - Customers



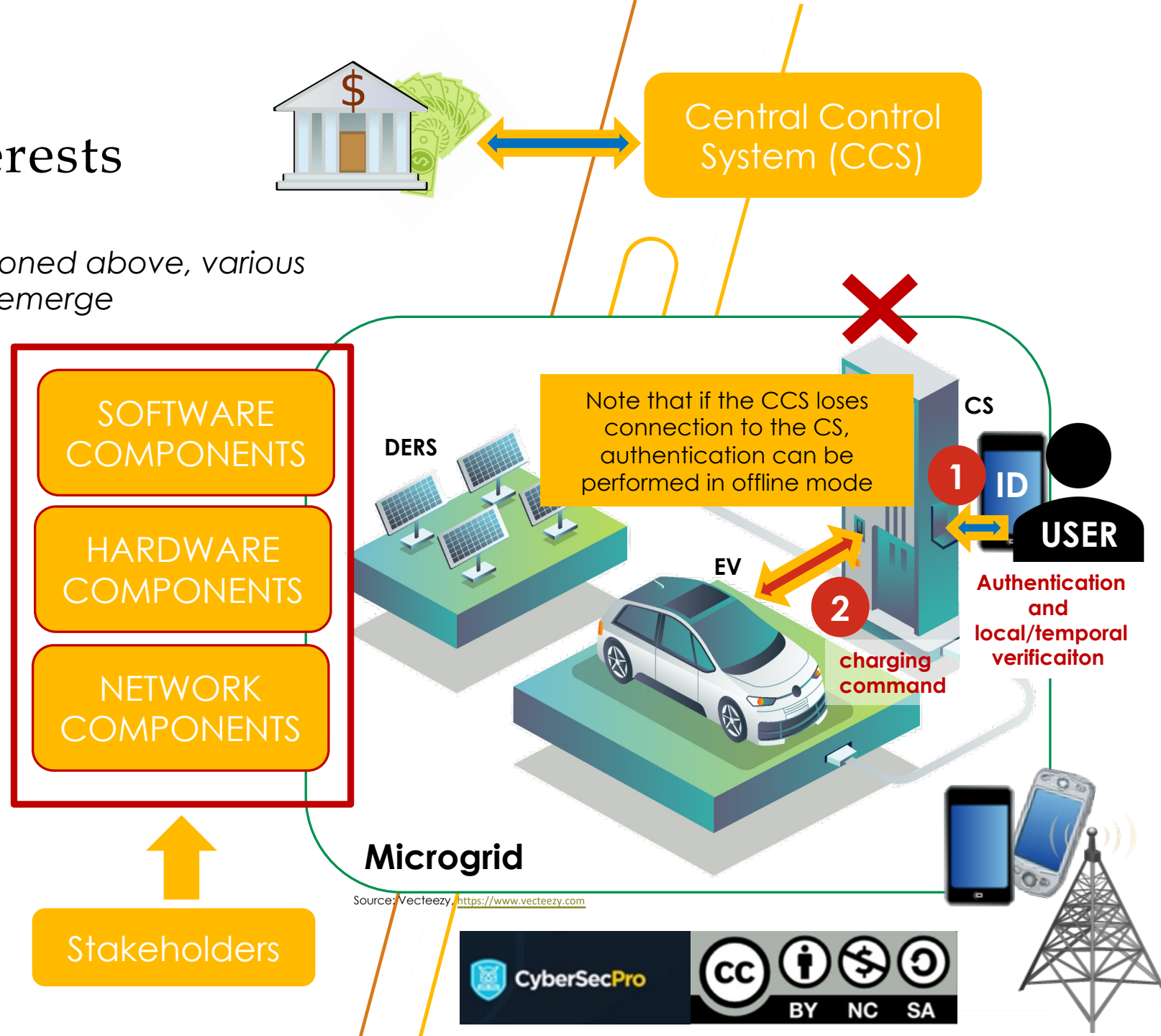
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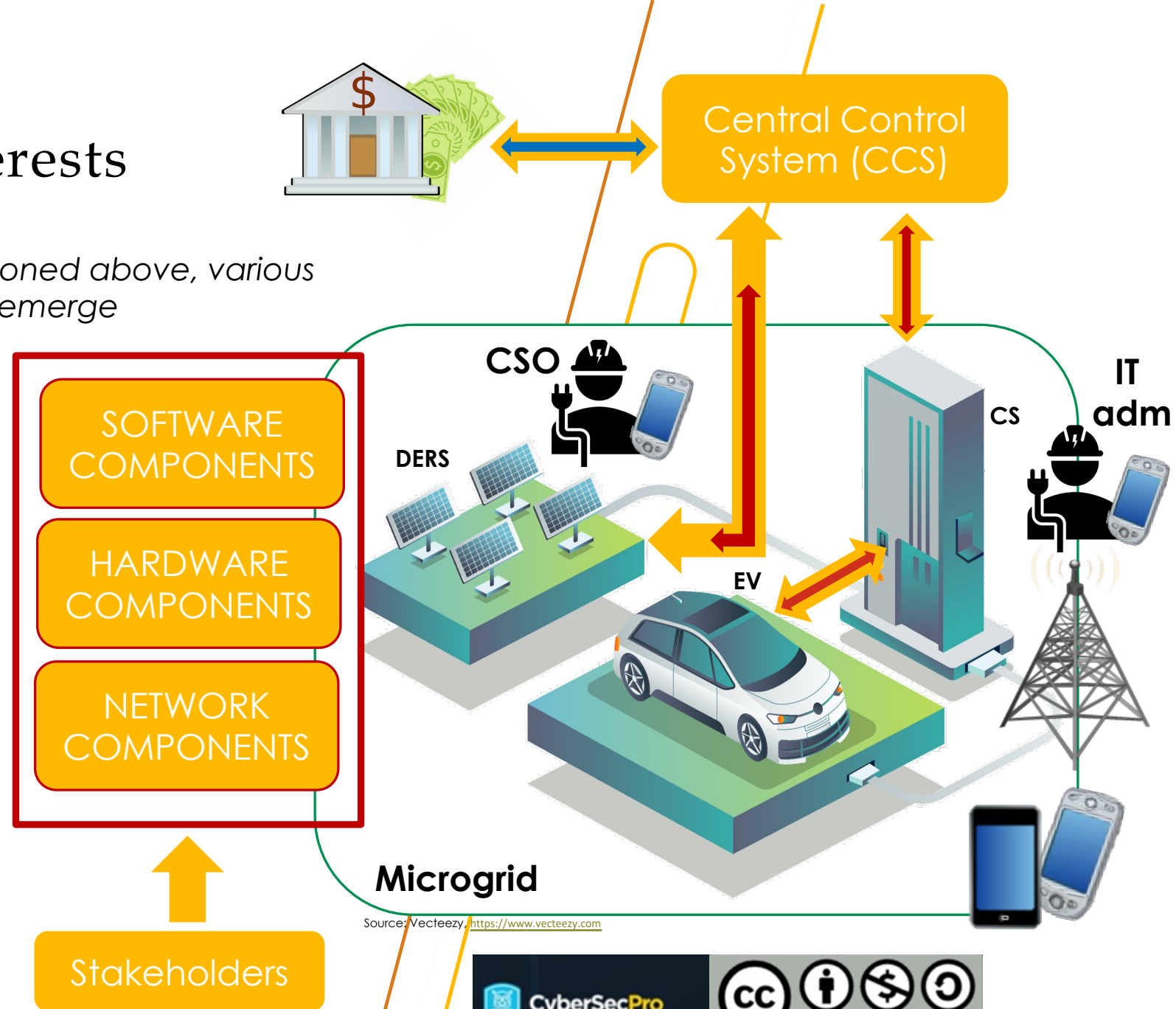
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Stakeholders and interests

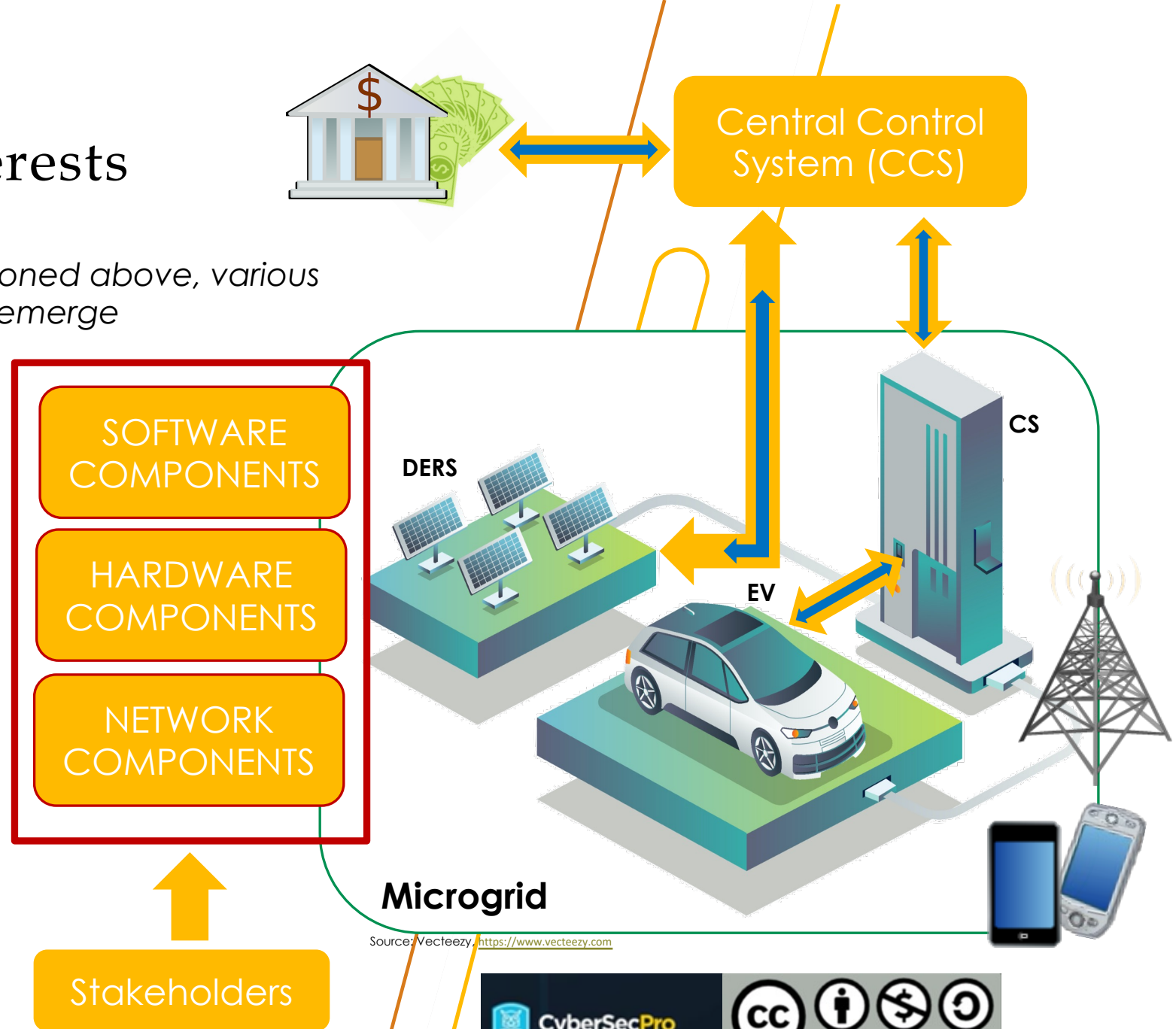
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 - Customers
 - IT Administrators
 - Charging Station Operator (CSO)



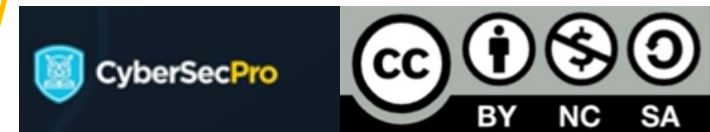
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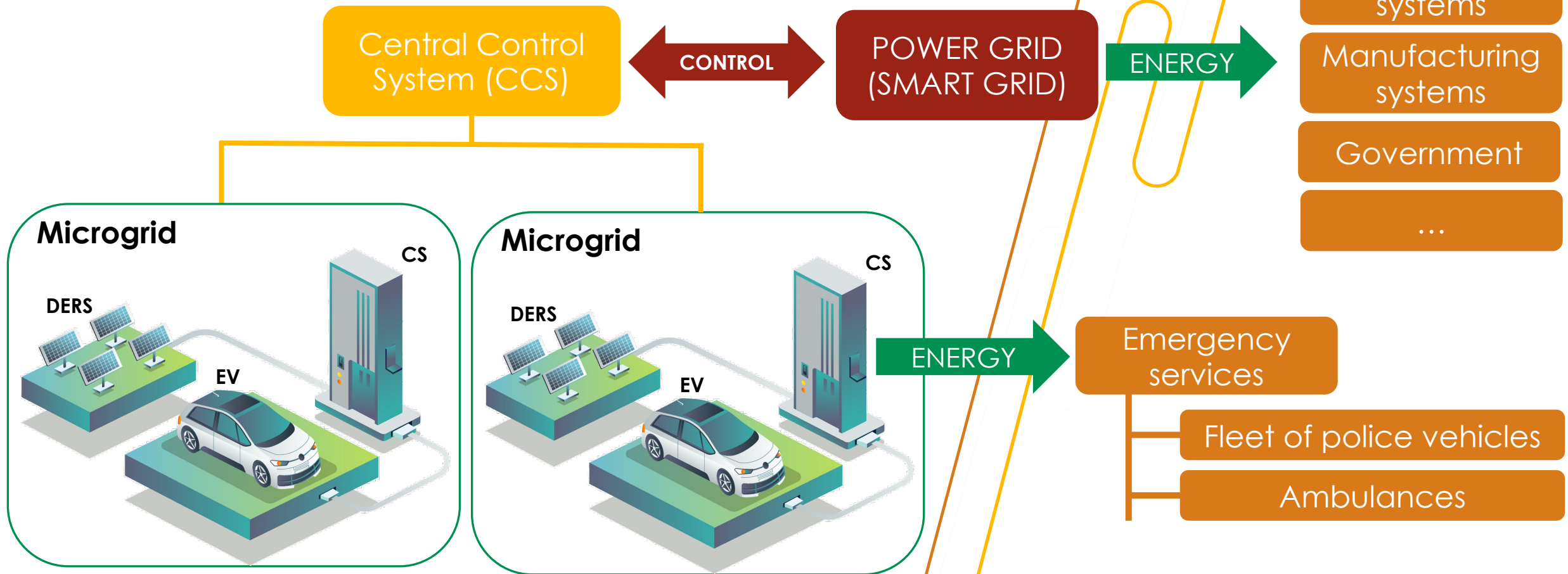
- Customers
- IT Administrators
- Charging Station Operator (CSO)
- The payment system
- Certificate Authority (CA)
- CS manufacturer and providers
- Law Enforcement personal
- ...
- *All of them making use of new technologies to lead tasks related to*
 - Reserve CS/EVSE
 - Charge
 - Maintenance
 - Supervision and control



Source: Vecteezy <https://www.vecteezy.com>



Relationships with other critical infrastructures



Source: Vecteezy, <https://www.vecteezy.com>

References and sources

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7. DeepL Translator for proofreading.
URL: <https://www.deepl.com/translator>



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If you have any questions, please do not hesitate to contact us:

- Cristina Alcaraz
alcaraz@uma.es